# Guidelines For Producing MIDI Files To Share With other Sound Canvas Users

*A SCUG Guide*

**Written by Bob Greaves with the assistance of other SCUG members**

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# Introduction

As the Roland Sound Canvas grows in popularity and evolves into a greater variety of models, the number of users desiring to compare notes grows. However, since not all Sound Canvas modules are identical, certain adjustments might be necessary in order to allow a MIDI sequence to sound the same on different modules.

Furthermore, many Sound Canvas users have upgraded to a "more exalted" model only to discover that their older creations do not sound the same on their new Sound Canvas. Several thoughts strike them when they discover this.

"I do not like this newer module, I want my old one back," or, "You mean this is what users of this model thought my creations sounded like!" Some who thought they lost all the sounds they were used to, sell their upgrade and repurchase an older Sound Canvas, others go about trying to figure out what needs to be done to get the old sound back on the new module.

Some solutions for upward compatibility have already appeared, but a few of them are poor solutions because they go too far too achieve compatibility. The SYSEX approach to change address 40 4X 01, for example leaves certain SC-88's and SC-88 Pro's in a crippled state that they can not recover from easily. As those users learn how to "heal" their crippled units they can make some costly mistakes loosing all their user modified sounds.

Take hope. There really is a simple way to create MIDI sequences on your Sound Canvas so that it will sound the same on any one else's Sound Canvas so long as they have either an equivalent model or a more advanced model.

The techniques to accomplish this are not as obvious as they could have been, but they are straight forward and very simple. Every Roland Sound Canvas is completely compatible with all other Sound Canvases from the same or later generation right out of the box.

Unfortunately, the Roland manuals actually suggested ways of applying the internal logic of these units in a manner that creates incompatibilities where they need not exist. The result unintentionally complicates upgrades and sharing.

So with the assistance of 8 other members of SCUG (Sound Canvas Users' Group) I offer this manual to facilitate smooth transition for users who upgrade and smoother workability for users who share their creations with each other. See the acknowledgment section in the last section to learn more about those who assisted me.

This text has more details than you need. Those of you very familiar with several Sound Canvas units and several MIDI sequencers can go immediately to chapter three and ignore the rest. However, because so many different sequencers and other MIDI devices used by SCUG members reuse or misuse terminology, the simple ideas of this text can be difficult to communicate.

There is no need to read every page unless you are curious about how other people who can not use your approach may need to go about accomplishing the same results. In many former attempts to explain how to make SC-55 sequences sound the same on the SC-88, others respond with, “I do not understand how to do that,” or else they say, “That’s so easy, why do you have to use so many words?” For more universal clarity I am repetitive and wordy.

This document will not tell you everything about the Roland Sound Canvas, but hopefully it will give you all the information you need to make your MIDI files truly shareable with other users. If you follow the guidelines suggested, your MIDI files will require no changes of any sort to keep them sounding the same to you if and when you upgrade to a newer Sound Canvas.

Chapter 5 lists several URL’s of interest to SCUG members including those directly related to this document. If you spot any errors in this document, please send email to RWGreaves@juno.com. Any corrections and or updates will be incorporated and the latest version will always be available for download within the various links of the SCUG web site.

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## Chapter One, Basics Sound Sets

# The Sound Canvas Family:

The Roland Sound Canvas is an excellent sound module family that can meet the needs of both beginners and experts. The family is characterized by a similar structure for mapping what Roland calls GS Variation Sounds built upon the foundation of a GM compatible sound set.

All Sound Canvases use at least a minimal Roland GS specification with the exception of the SC-7, SCB-7, RAP-10, and SCD-10 which were intended for the personal computer market as sound cards or daughter boards. The most common GS sound sets are often referred to as SC-55 Sounds, SC-88 Sounds, and SC-88 Pro Sounds.

These sound sets are characterized by 128 Capital Tones representing their GM compatible sound set but with variations to these Capital Tones available on additional banks. For example, the GM sound set includes only two synth bass sounds at patches 39 and 40. But the SC-55 added 4 additional synth basses by placing 2 each on variation banks of the two original GM patches.

The general rule followed by Roland with these additional variants to the GM sounds was to place them at the same patch number as the GM sound but on a different bank. This made locating and using variant sounds easier.

What follows is a brief history of the various generations of Sound Canvases combined with a brief history of how the mapping compatibility issue got so confused. For an up to date list of all the GS synths, point your browser to the Sound Canvas List maintained by Gary Agnew located at Http://www.in-motion.net/~agnew/sctypes.html.

## *The SC-55 Family:*

The 1st generation Sound Canvas was the SC-55 which had 317 sounds, 10 drum sets, and 24 notes of polyphony using up to 16 voices. One of the drum sets was actually a sound effects menu in a drum map. Later the SC-55 sound set was expanded to include 354 sounds and its polyphony was increased to 28 notes.

These 354 sounds also included the MT-32 sound set. And for compatibility with pre GM Roland synths, a CM-32L sound set was also available. However, all of the sounds of the CM-32L (sometimes called CM-64) are duplicated in the SC-55 Capital Tones or Variation sounds so this does not represent any additional sounds for the SC-55.

To select Variation sounds, the SC-55 can use both “Normal” and “controller #0” methods of bank switching. The controller #0 method is easiest because all that is required by your

sequencer is to enter a zero into controller #0 for Capital tones or the Variation number into controller #0 to select a variant bank just before sending a patch call.

The "Normal" method of bank selection did not exist when the first SC-55's hit the market. Fortunately, MIDI compliant devices must ignore controller messages they do not use. As a result SC-55's do respond correctly to Normal bank switching even though that was not considered in their design.

Normal bank switching uses both controller #0 and controller #32. Since the SC-55 ignores controller #32, sequencers that use Normal bank switching can still access all the Capital Tones and Variations on the SC-55 without any problems as long as the Controller #0 value they use is correct.

Sequencers that use the Normal bank switching method however, "simplify" the process by using a single number in the range of 0 .. 16,383. If you are an SC-55 user, this might be confusing at first. You never had to enter numbers larger than 127 before to get variation sounds.

In fact, most of you will discover that your sequencer won't allow you to enter a number larger than 127 in a bank field. Hopefully, chapter 3 will show you how to either use Normal bank switching or how to emulate it so that all your sequences will sound the exact same way on everyone else's Sound Canvas.

You can tell if your Sound Canvas is actually a member of the SC-55 family by the number of GS sounds available. If your manual features 317 or 354 total sounds, then regardless of what model Sound Canvas you use, it is for all practical purposes internally an SC-55

## *The SC-88 Family:*

The next generation Sound Canvas is called the Super Sound Canvas with the SC-88 sound set. This 2nd generation Sound Canvas also includes the complete sound sets of the 1st generation Sound Canvas. This means the SC-55, the MT-32 and the CM-32L sound sets are all included.

This gives the Super Sound Canvas a total of 654 unique instruments and 24 drum kits. Not all of the SC-88 sounds are new. Some of the SC-88 sounds are actually the SC-55 sounds duplicated into the SC-88 map. So of the 417 sounds mapped into the SC-88 sound set, only 300 of them are actually new sounds.

With the release of the SC-88, the Sound Canvas is now up to 64 note polyphony and can use two MIDI outs with up to 32 voices and 32 MIDI channels. The SC-88 is also capable of being split into two independent modules. This permits a GS-Reset on only one side and other independent operations.

With the SC-88 sound set, Roland decided to add new sounds by accommodating the Normal bank switching protocol, which in addition to controller #0 uses controller #32. They also decided to use the value of controller #32 (the LSB of Normal bank switching) to select what

they called a Map. This permits the SC-55 sound set to reside on internal Map 1 in a Controller #0 structure completely compatible and identical to the original SC-55 family of synths. This was an excellent design decision.

The newer SC-88 sound set is placed into a new Map with a structure that can optionally superimpose the older SC-55 map through a method that masks Map addressing. This too is a superb design decision. The new SC-88 map contains even more variation sounds in its Map than the original SC-55 Map. Taking advantage of this design, an SC-88 user can very easily audition what his SC-88 sequence will sound like if played on an SC-55.

Many SC-88's even include a switch that places them into "SC-55 Mode." The actual purpose of this mode is ***not*** to get SC-88's to play SC-55 sequences correctly. The purpose of this mode is just the opposite. It allows SC-88 users to play SC-88 sequences **"incorrectly"** to hear what their SC-88 file will sound like if played on an SC-55.

The SC-88 map is addressable on two maps (which was not altogether clear in the manual). It can be found directly at internal map 2 and also indirectly at map 0. However, the Roland manual suggests SC-88 users ALWAYS use map 0 to get SC-88 sounds without clarifying that map 0 actually does not exist and is in fact variable.

My personal opinion is that this is bad advice. It contributes to the compatibility problems and ignores the design advantages of internal map 2. Map 0 is both nonexistent and unstable. It is unstable because it can be altered to point to a different map. It is also unstable because it creates different sonic results in each generation of the Sound Canvas. Internal map 2, on the other hand is entirely stable and is consistent in use on all SC-88 and higher synths.

Map 0 on the SC-88 really redirects itself by default to internal map 2. This is how the SC-55 mode works on some (but not all) SC-88's. In SC-55 mode, map 0 gets redirected to map 1 (the SC-55 map) but by default it is usually pointed at internal map 2.

Above I used the phrase "internal map" because the original manual for the SC-88 called the SC-88 Map, "MAP 1" even though internally its value was 2. It also called the SC-55 Map, "MAP 2" even though its internal value was 1. I do not know why. I get the impression they wanted us to think of the newer map as holding the number 1 position.

I advise SC-88 users to never use Map 0. However, consider the following statements:

1. I write sequences that use SC-88 sounds but that also have to sound acceptable when played on an SC-55.

2. My SC-88 will not enter SC-55 mode correctly unless I use map 0.

If both of the above statements apply to you, then you can use map 0 during development. When your sequence is finished then switch all map 0 settings to internal map 2. Addressing all SC-88 sounds on internal map 2 seems more in keeping with the designed purpose of Map 2. If SC-88 users do that, then ALL their completed sequences will be solid SC-88 sequences and totally upward compatible with the SC-88 Pro.

If SC-88 users fail to change all SC-88 sounds to internal map 2 in their finished sequences, then those sequences lose their SC-88 sounds when played on the new SC-88 Pro. For clarity, I repeat, you retain the SC-88 sounds on an SC-88 Pro, if you change selected SC-88 sounds from map 0 to internal map 2.

Unfortunately, SC-55 users have overlooked the easiest way to make certain that their sequences would be compatible with the SC-88. It would have been helpful had Roland supplied the easy way to do this because they continue to sell and manufacture the SC-55 to this day.

The solutions offered by some Sound Canvas users seeking to get SC-55 sequences to sound right on the SC-88 are awkward, and ignore the flexibility and purpose behind expanding the MIDI standard to include Normal bank switching.

Sound Canvas users are not totally to blame. Although full compatibility was part of the SC-88 design, the exact method to be used to achieve upward compatibility is lost in the Roland suggestion to always use map 0 and in their silence in SC-55 manuals.

It would help greatly if the newer SC-55 manuals suggested the use of controller #32 (or the magic of Normal bank switching) to give SC-55 users the perfect tool to make their sequences sound the same on "higher" models. Anyhow, the lack of clarity from Roland and users' practices fogged a sharp view of the simple solution to compatibility and much muddle has followed.

"Uncorrected" SC-55 files will use SC-88 sounds and SC-88 Pro sounds on those respective units. The reason is not because those units are not in SC-55 Mode. The reason is because SC-55 sequences have no knowledge of maps and do not incorporate Normal bank switching or controller #32 which would be required to get them out of map 0.

SC-55 sequences used controller #0 bank switching which always defaults to map 0 in the absence of a controller #32 = 1 event. The MIDI design behind Normal bank switching was created to allow backward compatibility with Controller #0 bank switching units. The SC-55 map in the SC-88 is at a map value the equivalent of 1 above its original non existent controller #32 position in the SC-55.

A simple change to SC-55 files by adding controller #32 set to a value of 1 would make those SC-55 sequences always behave like SC-55 sequences on every Sound Canvas that has ever been built. This is because the SC-55 would ignore controller #32 set to 1, and the SC-88 and SC-88 Pro would use that controller #32 value to grab SC-55 sounds. This is why I admire so deeply the simplicity of design incorporated into the SC-88. It made compatibility a breeze.

As simple as that might seem, that is not how most users have been solving the mapping problem for older SC-55 MIDI files. Instead they have suggested SC-55 mode. Although that mode was supposed to make SC-88 sequences play like they would on an SC-55, it did make SC-55 sequences play "correctly."

But the SC-88 user had to first know that he or she is listening to an SC-55 sequence and then also push the button (if they had one) to enter SC-55 mode. Operator action is required. Not a fail-safe plan to get SC-88 owners to hear SC-55 files correctly.

Another solution was to give SC-55 owners a set of SYSEX commands that would automatically alter address 40 4X 01 and place the SC-88 into SC-55 mode. The idea was ingenious except that it does not actually place the SC-88 into SC-55 mode. No SYSEX can. It only resembles SC-55 mode but it delivers a couple of permanent kicks in the head that true SC-55 mode does not deliver.

SC-55 mode works by temporarily overriding values in memory. Press the switch and you have SC-55 mode. Press it again and SC-55 mode disappears. The SYSEX solution actually changes the memory values. The SC-88 is incapable of leaving a SYSEX induced SC-55 mode in a simple manner.

The SYSEX induced SC-55 mode actually cripples the SC-88 forcing map 0 to never point again to the native map until the SC-88 owner figures out how to do that! What is worse, if the SC-88 owner does not know that the SC-55 sequence did that to his or her Sound Canvas, then it may be a quite a while before they understand why they can't get SC-88 sounds anymore.

Instead of SC-55 users setting controller #32 equal to 1 in each track of *THEIR* sequences, these users try to use SYSEX messages to place *ANOTHER'S* SC-88's into crippled SC-55 mode. A GS-Reset will not undo a SYSEX induced SC-55 mode, nor will the SC-55 mode button, and some SC-88 models can not shake it even by a new power up.

You can tell if your Sound Canvas is a member of the SC-88 family regardless of what its name is by how many sounds are in it. If your manual tells you that you have 654 GS sounds, then your unit is for all practical purposes, internally an SC-88.

## *The SC-88 Pro Family:*

As of this writing (April of 1999) the most recent generation of the Sound Canvas is the SC-88 Pro. This 3rd generation module not only adds more sounds for a total of 1117 and 42 drum sets, but it also adds what Roland calls insertion effects.

The 64 insertion effects are actually a BOSS digital multi-effects sound processor that can insert itself into as many parts as the user desires. This not only adds to the flexibility of the already large array of effects available within the sound module, but adds some dynamics not possible previously.

Flexibility is improved because certain effects built in to the Sound Canvas are globally mutually exclusive. But now it is possible to use more than one type of delay or reverb. Now it is possible to combine many effects or to use different settings for different parts. In fact with the ability to split the module into two independent modules it is possible to use up to three different

types of reverb simultaneously on different parts. I have never needed to do that, but the flexibility exists.

New dynamics are also possible because when an instrument plays more than one note at a time, these notes can interact with each other producing various nuances uncharacteristic of the single notes. This is especially true when using distortion.

Mixing two sampled notes together does not always recreate these dynamics. But the use of insertion effects does a much better job of recreating these dynamics. Now a guitar using an insertion distortion effect can growl by playing two adjacent notes. This also restores the distortion dynamics present when sending any sound at varying velocities.

The sampled sound retains fully similar distortion dynamics at differing velocities whereas the insertion distortion can alter the amount of distortion as a function of the velocity of the note driving the effect. This sends the use of MIDI guitar emulation up a considerable notch.

The SC-88 Pro adds its new sounds through the use of yet another map. Internal map 3. I noticed that the SC-88 Pro manual never gives the map a numerical name, and does not refer to the SC-88 map as MAP 1. Instead the manual calls the three maps the SC-55 Map, the SC-88 Map and the Native Map.

Shortly after the SC-88 Pro hit the market many users upgraded and again confusion about how to get the old sounds back became even more of an issue. Now both SC-55 users who have not added controller #32 events and SC-88 users who did not switch to map 2 are unable to get the SC-88 Pro to play their sequences correctly.

I was disappointed to find in my SC-88 *ST* Pro manual on page 22, the advice to always leave controller #32 at 0. If and when the 4th generation Sound Canvas comes out, then the SC-88 Pro users who neglect to change map 0 sounds to map 3 when they were finished testing SC-55 and SC-88 mode will get their chance to complain that their sequences are using the wrong map on the SC-2000 Super Duper Sound Canvas.

Fortunately the SC-55 and SC-88 structure of internal maps 1 and 2 is identical to the mapping of the SC-88. The new native sound set of the SC-88 Pro is on map 3 where I predict it will also be on the 4th generation Sound Canvas. However, incompatibility issues will no doubt arise because the redirection of map 0 is not really explained clearly in the SC-88 Pro manual either. On the SC-88 Pro and above, maps 1, 2, and 3 will be totally stable, whereas map 0 will always be unstable.

You can tell if your Sound Canvas is a member of this family by looking in the manual. If your manual features 1117 unique GS sounds, then your unit regardless of what it is called, is for all practical purposes internally an SC-88 Pro.

## *In Conclusion*

The Sound Canvas, now in three generations, has a lot going for it and a lot of people going with it. Its upward compatibility is solidly designed. Things can only get better. Backward

compatibility is limited, but if this map 0 and controller #32 issue are not properly understood, then upward compatibility will never be achieved!

With three maps being used by Sound Canvas users, three different sonic results are possible. Sequences originally created for an SC-55 simply require a controller #32 = 1 event prior to each patch event in each track to guarantee they will always sound like an SC-55 sequence no matter what Sound Canvas plays them back.

SC-88 Sequences simply need to add 2 to the Normal bank value or change controller #32 from 0 to 2 prior to each patch call and they too will always sound like an SC-88 sequence on any SC-88 or higher Sound Canvas.

Lastly if SC-88 Pro sequences shifted their SC-88 Pro bank values up by 3 or changed controller #32 from 0 to 3 prior to patch calls, then they too would remain forever on every future Sound Canvas a consistent sonic file always sounding like an SC-88 Pro.

If you understand your unit very well and you understand your sequencer very well and if you understand the terminology used for bank switching, then you already know all you need to know to write upward compatible sequences. However, that is a lot of ifs. If you only know your sequencer, your Sound Canvas, and MIDI terminology well enough to use what you need, then implementing this information might be difficult.

In fact, depending on how your sequencer works, a deep intimate knowledge of MIDI and your Sound Canvas might still leave you in the dark. So in the chapter 3 we will look at this step by step from three different scenarios.

### Three Obstacles

There are actually three obstacles to compatibility between the three generations of Sound Canvases. One of them is unalterable but the other two are easily remedied. The first obstacle is the fact that the lower models do not have all the capabilities of the upper models. This of course creates an incompatibility that can not be helped. Backward compatibility will be limited.

The second obstacle to compatibility is that the SC-55 unlike its brothers does not require Normal bank switching to be fully exploited. However, since it can respond correctly to Normal bank switching and since it can ignore controller #32, SC-55 users can create files that sound correct on SC-88's and SC-88 Pro's.

The third obstacle is a misuse of map 0. Even though the SC-88 and the SC-88 Pro both use normal bank switching, the practice of always using map 0 causes a mapping inconsistency between them. This problem is further confused by the fact that SC-55 files that have not been "corrected" for upward compatibility, also use the unstable map 0 on all higher units instead of the SC-55 map.

In chapter 3 we will take a step by step explanation of several ways to implement the simple solution around these obstacles for each of the three generations of Sound Canvas.

**Two solutions**

Stay away from map 0 and use controller #32 for addressing the map you really want. If you understand this then skip over to chapter 3.

## Chapter Two, Understanding
## The Three Obstacles - And Two Solutions

# Finding the right paradigm:

To solve the compatibility problem once and for all so that you never need to fiddle with the front panel and never need to cripple someone else's sound Canvas might require thinking in a new way. It might not be easy because you will actually be fighting against the grain of thinking that has already become a precedent in Sound Canvas circles and by others who create products for Sound Canvas users.

For example, the typical instrument definitions used on MIDI sequencers expect all Sound Canvas users to use map 0 for native sounds. Using those definition, your software will not display the correct patch name when you have that patch directly selected on it own map. I feel like I am fighting the current of the Nile river when I suggest you avoid the permanent use of map 0. This may remain true for most sequencers even after it becomes an accepted fact that until we move away from map 0 there can ***NEVER*** be upward compatibility.

Although the solution to compatibility in this text is simple, the terminology used to express it has to cross several barriers. Most importantly there is a terminology barrier and the sequencer bank switching barrier.

### Terminology Barrier

Roland likes to use terminology that differs from standard MIDI terminology. Each sequencer used by SCUG members has its own terminology. This gets really confusing when we all use the same terms but mean different things.

This chapter runs deeper into definitions of terminology as used inside this text. If you feel you have a grip on what you need to do, skip to chapter three. However, if you get confused there, then return to this chapter. Depending on what sequencer you use and what other sound modules you may have used, certain terms can have a completely different meaning.

### Bank Switching Barrier

Not all sequencers work the same way. Some sequencers require the use of bank switching methods where you can enter bank numbers but not controller values. Other sequencers require you to enter values for controller #0 and controller #32 and have no awareness of "methods." Those sequencers and those who use them live in two different worlds. The terminology and approaches to our simple solution are completely different.

If your sequencer uses methods to change banks you might not have a clue yet how to directly address the three different maps. You may have noticed that every value for controller #0 or controller #32 you enter into your sequence is completely ignored and has no bearing on what

map you get. If you talk this over with other SCUG members who do not use a sequencer like yours they, will get the impression you are not too swift. All their advice will never help and they will misunderstand all your questions.

If your sequencer uses patch calls that immediately follow controller #0 and controller #32 settings then you may be already off and running with the solution. Yet, if I were to talk to you about bank numbers like 1025 you would scratch your head wondering what I am talking about.

## *Three obstacles to compatibility:*

1. New features limit backward compatibility.
2. Change in bank switching methods.
3. Use of map 0.

Let's accept obstacle 1 right at the start. There is no way to make use of sounds or features that do not exist on earlier models without compromises or accommodations. These will require some fending for ourselves, but if you get the forward compatibility obstacles cleared up then you will also be able to figure out the best compromises.

Obstacles 2 and 3 are fully resolvable. Once they are resolved, your sequences will sound identical on every Sound Canvas to what ever degree that is possible.

Obstacle 2, a change from controller #0 bank switching to Normal bank switching, may require some explanation. Only 2nd generation and above Sound Canvases use Normal bank switching. But the SC-55 can respond to it anyway in a manner fully compatible to the 2nd and 3rd generation Sound Canvas. Changing to Normal bank switching for many of you (but not all) opens the door to compatibility.

We need to define bank switching. This can be a confusing issue because each sequencer uses the terminology differently. Roland uses completely different terminology from standard MIDI lingo preferring words like Variation and Map. There are also banks switching methods and bank switching implementations which are identical in effect but different in how they are used. What a mess!

## *Understanding Bank Switching:*

Bank switching greatly enhances the number of sounds a sound module can offer. Without banks, the limit is 128 sounds. Using a single controller to enhance bank switching enables 128 banks. Each bank can hold up to 128 sounds. This would allow 16,384 sounds. Using two controllers to enhance bank switching enables 16,348 banks. If each bank held 128 sounds this would allow 2,097,152 sounds!

There are no modules that hold over two million sounds. The idea is not necessarily to jam pack as many sounds as possible into every bank. Instead this structure allows up to 2,097,152

places into which potential sounds can be placed. And this means the ability to organize a more modest number of sounds into a meaningful logical structure.

***Two methods for bank switching used by the Sound Canvas:***

1. Controller #0
2. Normal

By the time we are dealing with 2,097,512 potential places for a sound to be placed, things can get confusing. Every one using different terminology to divvy up the turf only adds to the confusion. So lets define how we will use these terms and also mention some of their substitutes or near substitutes.

**Bank Switching Method:** This is a protocol for enabling a MIDI device to locate different banks so that standard patch numbers can find additional sounds. All bank switching protocols have *exactly three* parameters. These parameters might appear in any order in your sequencer, but include a bank number, a bank method, and a patch number. If your sequencer does not use "methods" then you use controllers.

NOTE: Some sequencers do bank switching for you. Other sequencers make you do the bank switching for yourself. Some sequencers allow you to do it either way. If your sequencer does not use methods then what I just said might not make any sense to you.

A sequencer that does bank switching for you will give you a place to enter each of the three parameters. You will have one place for a bank number, one place for a bank switching method, and one more place for a patch number. You might have other fields related to the track or source but they are not directly related to the bank switching protocol. These sequencers never show you values identified as controller #0 or as controller #32.

If you are an SC-55 user who uses the sequencer method of "Controller #0 bank switching" (Please notice I did not say if you use controller #0 to do bank switching), then you may have noticed that the bank number and the required value of controller #0 are the same. Do not let this confuse you. The bank number is not a controller #0 number. It is a number used to calculate the value of controller #0. They are not the same number, one determines the other. They only end up with the same *value*.

This might be especially confusing to SC-55 users. Perhaps this will help. If you have to enter a controller #0 event to get sounds, then you do not use your sequencer's bank switching method to do bank switching for you. You do it for yourself. You are not using the *method* called "Controller #0 bank switching." You are using controller #0 to do your own bank switching.

If your sequencer does not do bank switching for you using a method, then it will have some provision for letting you do the bank switching yourself. It will allow you to enter controller values directly into controller events and also allow you to follow those controller events with a separate patch call.

Regardless of whether you use the Controller #0 bank switching method or use controller #0 to do your own bank switching, the result is identical and the MIDI file works the same way. The results are for all practical purposes identical.

Cakewalk is an example of a sequencer that does bank switching for you. Although you can enter any valid controller events anywhere in Cakewalk. You can not enter a patch into Cakewalk without Cakewalk inserting behind the scenes its own controller value(s) based on the Bank Switching method and bank value used in the patch event. Those behind the scene insertions can override all controller #0 and controller #32 events.

Metro is an example of a sequencer that lets you do bank switching for your self. You can enter the controller or controllers required to select the correct bank and then you enter the patch event separately.

**Controller #0 Bank Switching:** This is a sequencer **method** of bank switching that uses the three parameters of Bank switching method protocol (bank, bank method, and patch number). This method determines how your sequencer interprets the bank number. In controller #0 bank switching your sequencer has to calculate controller values.

If valid bank values are in the range 0..127 then your sequencer uses the formula:

Controller #0 = bank.

Somewhere there might be a sequencer that uses valid bank values in the range 1..128. If so then that sequencer uses the formula:

Controller #0 = bank -1.

If you enter controller #0 events then you are doing the bank switching for yourself. You are not using the sequencer *method* called "Controller #0 Bank switching."

**Normal Bank Switching:** This is a **method** of bank switching that uses the three parameters of Bank switching method protocol (bank, bank method, and patch number). This method determines how your sequencer interprets the bank number. Valid bank numbers are in the range 0..16,383. In normal bank switching, the sequencer uses two formulas.

Formula 1: Controller #0 = INT (bank / 128)
Formula 2: Controller #32 = bank - (INT (bank / 128) * 128)

The reverse formula is easier. If you know the required controller #0 and controller #32 values you can calculate the Normal bank number.

Normal Bank = controller #0 * 128 + Controller #32.

If you have to enter a value for controller #32 and controller #0 to get the sounds you want, then you are not using the sequencer method called Normal Bank Switching. You are using controller #32 and controller #0 to do the bank switching for yourself.

Both approaches get identical results, both approaches send the exact same controller values to the Sound Canvas. They just go about getting there differently.

If you are trying to enter a number like 1025 into a bank and your sequencer will not take a value greater than 127, then either your sequencer is not set up for the method called Normal Bank switching or you are trying to place Normal Bank switching numbers into a controller.

## *How do Maps Work?*

If you have ever used a spread sheet program that allows you to use to combine several similar spread sheets on different "pages," then you have a picture of Maps. It is like having a spreadsheet with 128 rows and 128 columns. You could then fill in some of the cells of the Spreadsheet-55 placing SC-55 sounds in a certain row and column based on its patch number and its variation number.

That gives a good picture of how the sample memory in the SC-55 is "mapped" out. As we move to the SC-88, we decide to change the spreadsheet from 1 page to 3 pages. We take the original SC-55 page from the older spreadsheet and make it page 1. Then we add a whole new page filled with new sounds and call it page 2. We then add a third page but we leave it empty. We call it page 0. We then make certain the pages are in order from page 0 to page 2.

We fill page 0 with formulas. Each formula allows that cell to point to any other page based on the value of a "page 0" variable. We then make the variable equal 2 by default for users of Spreadsheet-88. Now page 0 points to page 2 and the two pages appear to be identical. We then tell people to never use page 2 just look at page 0. (HINT: this is bad advice.)

Then we create the Spreadsheet-88 Pro and add a 4th page to the spreadsheet and call it page 3. We also change the "page 0" variable so that page 0 will always point to page 3 by default. We also tell users of Spreadsheet-88 Pro to not use page 3, just use page 0. (HINT: bad advice gets even worse.)

This is a picture of Maps in the Sound Canvas family. The SC-55 uses a spreadsheet with a single unnamed page. The SC-88 uses a spreadsheet with 3 pages named 0, 1 & 2. And the SC-88 Pro uses a spreadsheet with 4 pages named 0, 1 ,2 & 3.

The way the "page 0" variable works for the SC-55 is that you can give it a page number but it always ignores you. You say, "Page 3," and it gives you its only page without a hint of difficulty. You say, "Page 0," and it gives you its only page with just as much ease.

To make these maps work for us we want to be consistent in avoiding page 0. What if when we want an SC-55 sound we tell each spreadsheet, "Page 0." They all obey but obey differently. Each one is pointing to its native page. We say, "Page 1." They all obey. This time its perfect they are all displaying the exact same page.

When we want SC-88 sounds we tell each spreadsheet, "Page 2." They all obey. But the SC-55 is the only one using the wrong page. That is as good as it gets because that is the only page the SC-55 has. But the SC-88 and SC-88 Pro are on the exact same page.

When we want SC-88 Pro sounds we say, "Page 3." Each Sound Canvas again obeys. However, the SC-55 is still stuck on its only page. The SC-88 will have a different reaction depending on what model it is because it has no page 3. But the SC-88 Pro and the 4th generation Sound Canvas not yet available will display the exact same page. Backward

compatibility is limited but forward compatibility is perfect. Now that you have a picture of how maps work we can now ask, “How can we tell the spreadsheet to use a specific page?”

Each of the 32 parts in your SC-88 or higher can address maps independently. The specific map a particular part is using can be manipulated or understood in several ways. You can talk about modes, controller #32, SYSEX, indirect map addressing or direct map addressing.

**Modes:**

The SC-55 Mode and the SC-88 Mode are modes that temporarily mask map addressing in the Sound Canvas. SC-55 mode basically operates by temporarily redirecting every map to map 1. If your SC-88 Pro will accept a number larger than 3 (most won’t) at the Tone Map 0 address 40 4X 01, then it will go silent. But press the SC-55 mode button and suddenly you are listening to an SC-55 sound which has masked the value of Tone Map 0 with a 1.

The SC-88 mode is a mode available only on the SC-88 Pro. In this mode all sounds from map 0 and map 2 are masked and sent to map 2. Sounds directed to map 1 remain directed to map 1. Sounds directed to map 3 not found on the SC-88 map go silent. Once the SC-55 Mode and the SC-88 Mode are stopped, all maps return to their previous state even if the previous state was not the default state. Direct map addressing ***does not*** bypass the mode switch on most Sound Canvases. Modes affect all parts.

The purpose for using modes is to hear what your composition will sound like on an earlier model.

**Controller #32:**

Whatever the current value of controller #32 is on any part, will be the map used at the next patch call for that part. Unlike Modes which take effect immediately on all parts, a change in controller #32 affects only one part at a time and does not take effect until a patch call occurs on that part. The value of controller #32 is kept in memory at address 40 4X 00. The only exception is when controller #32 has a value of 0. When that happens then the value stored at Tone Map 0, 40 4X 01 will override its setting.

The purpose of controller #32 is to extend options for bank switching. When combined with controller #0 the options are greatly extended.

**SYSEX:**

Using SYSEX to place a new value into Tone Map 0 at 40 4X 01 will give controller #32 a new meaning but only when controller #32’s value is 0. If this address is set to 1 then controller #32 events that are equal to 0 will use the SC-55 map on the next patch call. You can do this to your own unit, but it is not a good idea to do this to someone else’s unit because a GS-reset will not undo this tinker. Direct map addressing ***does*** bypasses the SYSEX tinker completely.

One purpose of this SYSEX is that it can alter the default map used after a GM-reset. Unlike modes which affect all controller #32 values, the SYSEX affects parts only when controller #32 =0.

**Indirect Map Addressing:**

This is the function of controller #32 when set to 0. Map 0 does not actually exist. Map 0 is any Map you want it to be. Place a different map value into Tone Map 0 at 40 4X 01 and the part so affected will use that map when map 0 is asked for. Its a neat little tinker, but what it is really useful for is causing trouble.

Since every map is always fully directly addressable why do this? The only useful purpose I can think for using it is to repeat a GM sequence several times, changing what map it uses each time without changing the sequence.

**Direct Map Addressing:**

This is what you do every time you call a patch when controller #32 has a non-zero value. This form of addressing a map is stable. It will never change. Files that address maps this way will work on every Sound Canvas that plays them so long as they have the maps available. Theoretically we can go through 127 generations of Sound Canvas before controller #32 has reached its potential.

The purpose of direct addressing is upward compatibility.

**Understanding Map 0:**

As we said above, the 3rd obstacle to upward compatibility is the misuse of bank 0. Do not use bank 0 for native map sounds unless you need them during the development phase. After development, change all patches to use direct addressing. The truth is Map 0 does not exist. Map 0 is only a place for the Sound Canvas to send you to another map. Think of it as a Go To Jail map.

Each of the three generations of Sound Canvases respond to sequences with map 0 patches in a unique manner. Three different sonic results are unavoidable with patches that reference map 0 sounds.

The way Roland engineers designed the series of Sound Canvases, they all use map 0. Even the SC-55 uses map 0. Well -- sort of. No matter how you accomplish the switching of maps, variations or banks or whatever you end up calling them, the native sounds on the SC-55 are located internally on the SC-55 by a process effectively identical to map 0 addressing. In fact all 128 possible controller #32 maps are interpreted by the SC-55 as if they were the SC-55 map.

However, once you move up to the 2nd generation or higher, the SC-55 map is logically set up as map 1. So compatibility says, “Hey why not always use map 1 on every Sound Canvas to get SC-55 sounds.” We can even use map 1 on the SC-55.

You might object, “But the SC-55 does not really have a map 1.” I say whisper quietly because the SC-55 does not know it does not have a map 1. You get to map 1 through controller #32. The SC-55 ignores controller #32. So if you try to go to map 1 on the SC-55 you go nowhere. You just stay right where you are. And that is where you want to be, using SC-55 sounds on map 1 just like **ALL** the other Sound Canvases do.

**NOTE: The net effects of these guidelines is to 1) add a Controller #32 = 1 event before every patch for SC-55 sequences, 2) to replace the Controller #32 = 0 events in the SC-88 sequence with a Controller #32 = 2, and 3) to replace the Controller #32 = 0 events in the SC-88 Pro sequence with a Controller #32 = 3.**

Exactly how we accomplish that will differ depending on how your sequencer works because many sequencers hide most controller #32 events as a parameter in the patch event or in an unseen setup area. If your sequencer does not hide any of them, then simply adding or editing the controller #32 event prior to every patch is all you need to do. If the patch events in your sequencer embed controllers parameters into bank parameters, then the procedure might be a bit more complicated.

## *SYSEX is the wrong way to "fix" SC-55 or SC-88 sequences*

In the SC-88 and above Sound Canvas models, an internal address at 40 4X 01 holds a number that determines what map should be used when map 0 is addressed. On some newer SC-55 models it is possible that this address is hard wired as a 1. On other SC-55 models it is an address that either does not exist or is totally ignored.

At first it might seem as though writing a SYSEX poking a 1 or a 2 into this area is the best way to make the SC-88 and above emulate the SC-55 or SC-88. Although poking a 1 or a 2 into this address for each part will accomplish the effect, it will also have other side effects that will be frustrating to the SC-88 and SC-88 Pro user (and the future 4th generation Sound Canvas user).

This address is unaffected by a both a GS reset and a GM-reset. The only way for the SC-88 and SC-88 Pro to recover from this parameter alteration is to poke a 2 or a 3 back into it for each part altered, or to do a factory reset. Some SC-88 and SC-88 Pro models do a factory reset at power up. Others like the M-GS64 and the SC-880 do not. Even the SC-55 mode button will not undo the SYSEX message.

You can't create a sequence that can know what Sound Canvas it is playing on, so it can't know what value was in that address before you poked a 1 or a 2 into it. Since you do not know the original value, you can't restore the original value. Your sequence should use a method that will work every time on any Sound Canvas and that will stop working the moment your sequence ends. The SYSEX approach does not meet these requirements.

NOTE: You might need to edit the instrument definition for your sequencer so that it addresses map 2 directly for SC-88 native sounds or map 3 for SC-88 Pro sounds. The GREAVES.ZIP or RWGSCINS.ZIP files contain Cakewalk instrument definitions for the Sound Canvas that already follow these guidelines. (See Chapter 5 for URL's)

# Chapter Three, Implementing The Solution - Step by Step

# Implementing compatibility:

We started Chapter Two with a list of the obstacles to compatibility. Let me repeat them again:

## *Three obstacles to compatibility:*

1. New features limit backward compatibility.
2. Change in bank switching methods.
3. Use of map 0.

Once you understand obstacles 2 and 3, their solution, and how they affect MIDI playback, you can figure out your own approach to resolving it. But many Sound Canvas readers did not want to be required to understand hexadecimal math, LSB & MSB terminology, indirect addressing, and various other concepts. Most Sound Canvas users just want to know, "What do I do?"

So, in this chapter we will look at each Sound Canvas one generation at a time. There is only one good solution to the problem being recommended in this document but there are several ways to implement it. Since among us we use many different sequencers, each of us may need to use an approach that others can not use.

Of the sequencers in use I have narrowed the way they select sounds down to three ways. Your sequencer either does bank switching methods for you, or it allows you to do the bank switching yourself. The third possibility is the sequencer that will do a hybrid approach.

Below I will show you step by step for each generation of Sound Canvas how to "correct" your files for upward compatibility. I will show you three ways to do it.

### Using Methods

This is for sequencers that do bank switching for you requiring from you the three parameters of a single bank number, a bank method , and a patch number. The advantage of this is that each bank regardless of map will have its own unique number. Furthermore, all the information required is embedded into every patch call.

The disadvantage is that the bank numbers you use are not found in the Roland manual but have to be calculated by multiplying the controller #0 value by 128 and adding the controller #32 value.

**Using Controllers**

This is for sequencers that permit you to enter in controller events and allow you to enter patch events separately from controllers or methods. The advantage of this is that you can use values for controller #0 that are identical to the variation number. You can also use values for controller #32 that are equal to the map number.

The disadvantage is that you can lose track of what the controller values are if you do not use them both immediately before your patch event. Another disadvantage is that many instrument definitions ignore controller events so that your sequencer can not display for you the correct patch name. All you see are numbers or the text for one map.

**Using Hybrid Technique**

This is for sequencers that allow you to use the Controller #0 method, but not the normal method. Or for those of you who want to use the Controller #0 method while placing ahead of each "Controller #0 method patch call," your own controller #32 event.

The advantage of this approach is that you can still use values for bank and controller #32 that match the Roland variation and map numbers. But you will need to use a vague instrument definition that is multi-mapped for each sound name.

**Before we get to the details**

You might want to read each section of this chapter because much of the explanatory information applies to all generations of the Sound Canvas and wont be completely repeated in every section. Besides, the more you understand about what other users need to do the better you will understand your own.

## *SC-55 Users:*

The SC-55 was designed to respond to controller #0 bank switching but it can respond to Normal bank switching without any problems. It simply ignores the controller #32 value. In each of the listings in this section we will try to get the SC-55 sound "Nylon Gt.2." This is PC 25, Variation 32.

Remember that PC 25 is MIDI patch number 24. Also remember our goal is to create a patch call in our sequences that will call the SC-55 patch on every Sound Canvas.

**Using Methods:**

Using the Controller #0 method, you used to do something like this:

***Event Listing 1***

***Patch, Controller 0, 32, 24***

For the benefit of all, I'll explain Listing 1, one parameter at a time. Parameter 1 tells you that this is a patch event. The fact that there are exactly three more parameters in one event should tell you it is using a bank switching method protocol. Parameter 2 tells you it uses the controller #0 bank switching method. Parameter 3 tells you that the bank number will set controller #0 to a value of 32. Parameter 4 tells you it then calls Roland PC 25.

To continue using methods, now you need to change over to the Normal Bank Switching Method. Lets do that, but without making the map correction. Now your listing will look like this:

***Event Listing 2***

***Patch, Normal, 4096, 24***

In Listing 2, parameter 1 tells you this is a patch event. The fact that there are exactly three more parameters tells you it is using a bank switching protocol. Parameter 2 tells you it uses a Normal bank switching method. Parameter 3 might not tell you anything yet. What it is attempting to tell you is that it will use the bank value to set controller #0 to a value of 32 and controller #32 to a value of 0. Parameter 4 tells you it then calls PC 24.

The main difference between these listing 1 & 2 is that the first uses only one controller for the bank value whereas the second uses two controllers extracted from the bank value. On an SC-55, Listings 1 & 2 call the exact same patch. Normal bank **4096** and controller #0 bank **32** are the exact same bank.

Now if we want to up the value of controller #32 to use map 1 we get a listing like this:

***Event Listing 3***

***Patch, Normal, 4097, 24***

In Listing 3, parameter 1 tells you this is a patch event. The fact that there are exactly three more parameters tells you it is using a bank switching protocol. Parameter 2 tells you it uses a Normal bank switching method. Parameter 3 tells you it will use the bank value to set controller #0 to a value of 32 and controller #32 to a value of 1. Parameter 4 tells you it then calls PC 24.

The obvious difference between listing 2 & 3 is that listing 2 uses map 0 (extracting CC32 from bank 4096), but listing 3 uses map 1 (extracting CC32 from bank 4097). Other than that, they both call the exact same patch on the SC-55. But the huge difference between listing 2 & 3 is that listing 2 calls a different patch on the SC-88 and a still completely different patch on the SC-88 Pro. **But Listing 3 Calls the SC-55 sound** on every single Sound Canvas there ever was or ever will be. And we did this without any SYSEX or Mode switching.

| To Get SC-55 | Controller #0 Bank Number | Formula to Convert | Normal Bank Number |
|---|---|---|---|
| Capital Tones | Use Bank 0 | 0 * 128 + 1 | Use Bank 1 |
| Variation 1 | Use Bank 1 | 1 * 128 + 1 | Use Bank 129 |
| Variation 2 | Use Bank 2 | 2 * 128 + 1 | Use Bank 257 |
| Variation 3 | Use Bank 3 | 3 * 128 + 1 | Use Bank 385 |
| Variation 4 | Use Bank 4 | 4 * 128 + 1 | Use Bank 513 |
| Variation 5 | Use Bank 5 | 5 * 128 + 1 | Use Bank 641 |
| Variation 6 | Use Bank 6 | 6 * 128 + 1 | Use Bank 769 |
| Variation 7 | Use Bank 7 | 7 * 128 + 1 | Use Bank 897 |
| Variation 8 | Use Bank 8 | 8 * 128 + 1 | Use Bank 1025 |
| Variation 9 | Use Bank 9 | 9 * 128 + 1 | Use Bank 1153 |
| Variation 16 | Use Bank 16 | 16 * 128 + 1 | Use Bank 2049 |
| Variation 24 | Use Bank 24 | 24 * 128 + 1 | Use Bank 3073 |
| Variation 32 | Use Bank 32 | 32 * 128 + 1 | Use Bank 4097 |
| MT-32 sounds | Use bank 127 | 127 * 128 + 1 | Use Bank 16257 |

For those who will use methods. You first need to change what method you use from Controller #0 method to Normal method. Then you need to multiply the variation number by 128 to convert it to a normal method number. Then you add 1 to change it from map 0 to the SC-55 map which is map 1. You can use the table above as a short cut.

**Using Controllers:**

To get the SC-55 sound "Nylon Gt.2," (PC 25, Variation 32), you used to do something that looked like this:

***Listing 4***

```
Controller #0, 32
Patch 24
```

This calls variation 32, PC 25 which was OK for the SC-55 but to force map 1 on all the other Sound Canvases we need to add another statement that the SC-55 will ignore but other Sound Canvases use to get the SC-55 map.

***Listing 5***

```
Controller #32, 1
Controller #0, 32
Patch 24
```

Simply adding the controller #32 statement in front of the Controller #0 statement causes this listing to call the same SC-55 sound on every Sound Canvas there is. No SYSEX no methods, just an added controller. Simple.

**Using Hybrid Technique:**

If you were using the Controller #0 method in the past, it is possible to continue using the controller #0 method. All you need to do is add a controller #32 event before each patch call. However, remember that if your sequencer uses a set up page to initialize tracks, the hybrid technique will not work unless you repeat the patch call in your event listing with the controller #32 event preceding it:

Formerly you selected Nylon Gt.2 this way:

***Listing 6***

***Patch, Controller 0, 32, 24***

This is the exact same listing as listing 1. But using a hybrid technique you can now use a listing that resembles this:

***Listing 7***

***Controller #32, 1***
***Patch, Controller 0, 32, 24***

Listing 7 will call the correct SC-55 sound on every generation of Sound Canvas there is.

***So what does this change do to my SC-55?***

What this change in bank select method does to your SC-55 is this. Nothing. The SC-55 ignores all controller #32 events. Isn't that reassuring. A lot of trouble and change for nothing. Yes it is, but it is the only way to insure that you will still change nothing when you upgrade or give your sequence to another SCUG member with a 2nd generation or higher Sound Canvas.

You may need to change your instrument definition if your sequencer displays incorrect information and you have changed from controller #0 bank switching to Normal bank switching. If you use cakewalk, you do not need to rewrite your definition, I recommend you use my instrument definition which already works based on the bank formula table above. It comes in a zip file named "GREAVES.ZIP" or "RWGSCINS.ZIP" and can be found at the Canvas Carry All web site or my Think MIDI web site. (see Chapter 5 for all URL's)

IMPORTANT NOTE! If you are using methods, please realize that the method of bank switching is embedded in a MIDI file in every patch call. Therefore you will need to change BOTH the default switch method from Controller #0 to Normal, AND you will also have to reselect the bank switching method in every track at every patch change in each of your files. The bank switch method used to create a  file takes precedence over the default you currently use when editing a file.

## *SC-88 Users*

We begin this section for SC-88 users talking about what you can do to help SC-55 users. When we have discussed this sufficiently, we will then talk about what SC-88 users can do so that their sequences will sound exactly the same on the SC-88 Pro.

### Accommodating SC-88 sequences for the SC-55

It is important to point out right from the start that using the SC-88 family will mean that those using the SC-55 family will never be able to hear what you created the way you created it until they upgrade. They do not have any of the SC-88 sounds available on their SC-55. They also have a polyphony limit of 24 or 28 notes which is small compared to your limit of 64.

There is no backward compatibility. That is part of the cost of progress. I can't use programs written for Win98 on my other computer running Win3.11. The best we can shoot for is some level of accommodation for SC-55 users.

You bought the SC-88 so use it. Do not allow your creativity to suffer avoiding the SC-88 sounds. The fact that SC-55 owners can't hear it like you wrote it is not your problem. The only way *they* can solve *their* problem is to accept the fact that they can not hear what you created correctly until they upgrade. Nonetheless, there is still a great deal you can do to help them make the accommodations they will require in order to have a general idea of what your creation is like.

First be aware of the fact that many of the SC-88 sounds are actually duplicates of the SC-55 sound. For example, the Capital Tone Synth Strings 2 is the same sample on the SC-55 map, the SC-88 map and the SC-88 Pro map.

If you are aware of what sounds are duplicated from lower maps then you help SC-55 users minimize accommodations when you actually select the sound you want from the SC-55 map. There is no difference in the quality of SC-55 sounds that are duplicated on the SC-88 map. When you use the SC-55 map for those sounds, SC-55 users know that at least *THAT* sound is the very sound you had in mind even though you used a more advanced Sound Canvas.

You might want to let SC-55 users know somehow in your documentation when you use SC-88 sounds that have no corresponding SC-55 sound. For example, if you use the detuned sitar (PC 105, Variation 2, SC-88 Map) then SC-55 users will either hear Piano 1 or silence. Some documentation in your sequence that identifies the sound you used is helpful.

Full backward compatibility does not exist. If you really want SC-55 users to hear your creation in the best possible way, then recreate an SC-55 versions of your song. Select only SC-55 sounds and make the best compromises you can. Some songs might not lend themselves to this approach. That's life.

However looking at forward compatibility, there are still compatibility pitfalls to be avoided. SC-88 Pro users will also not hear your creation properly unless you make some adjustments. If you make these adjustments, then they will hear your creation exactly as you intended it.

### Making SC-88 sequences upward compatible:

The SC-88 was designed to respond to the Normal bank switching method. Depending on the sequencer you use, you use the Normal method or you directly change controllers #0 & #32 for yourself. Perhaps some of you use the hybrid technique that combines the controller #0 method preceded with a controller #32 event.

As we demonstrate each approach, the listings in this section will show what you have been doing and what you can now do to ensure upward compatibility. In each of the listings in this section we will try to get the SC-88 sound "Nylon+Steel" This is PC 26, Variation 9.

Remember that PC 26 is MIDI patch number 25. Also remember our goal is to change all patch calls in our sequences to call the same patch on both SC-88's and SC-88 Pro's by using map 2.

### Using Methods:

Using the Normal method, you used to do something like this:

***Event Listing 8***

***Patch, Normal, 1152, 25***

In Listing 8, parameter 1 tells you this is a patch event. The fact that there are exactly three more parameters tells you it is using a bank switching protocol. Parameter 2 tells you it uses the Normal bank switching method. Parameter 3 tells you that your sequencer will extract from the bank value of 1152 controller values to set controller #0 to a value of 9 and controller #32 to a value of 0. That means you are accessing SC-88 sounds indirectly on unstable map 0. Parameter 4 tells you it then calls PC 26.

Now we want to raise the value of controller #32 to use stable map 2, so we get a listing like this:

***Event Listing 9***

***Patch, Normal, 1154, 25***

In Listing 9, parameter 1 tells you this is a patch event. The fact that there are exactly three more parameters tells you it is using a bank switching protocol. Parameter 2 tells you it uses the Normal bank switching method. Parameter 3 tells you it will use the bank value to set controller #0 to a value of 9 and controller #32 to a value of 2. Now you are accessing SC-88 sounds directly on map 2. Parameter 4 tells you it then calls PC 26.

The difference between listing 8 & 9 is that listing 8 uses map 0 (extracting CC32 from bank 1152), but listing 9 uses map 2 (extracting CC32 from bank 1154). Other than that, they both call the exact same patch on the SC-88. But the huge difference between listing 8 & 9 is that listing 8 calls a different sound patch on the SC-88 Pro. **But Listing 9 calls the SC-88 sound** on every single 2nd generation or higher Sound Canvas there ever was or ever will be. And again we did this without any SYSEX or Mode switching.

If you already use the Normal bank switching method, you are already accustomed to entering strange numbers like 1152 instead of 9 to get variation 9 sounds. All you need to do when you have completed your sequence is to add 2 to every SC-88 native bank you used in map 0. You can isolate them because all map 0 Normal bank numbers are evenly divisible by 128.

Use the following table to double check the bank values you used. Test and save the file and you are done. Your file will sound correct on an SC-88 and beyond.

| Variations on the SC-88 Map | Do not use Map 0 Normal Banks | Instead use Map 2 Normal Banks |
|---|---|---|
| 0 (Capital Tones), 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 16, 17, 18, 19, 24, 25, 26, 32, 3, 40, 64, 65 | 0, 128, 256, 384, 512, 640, 768, 896, 1024, 1152, 1280, 1408, 2048, 2176, 2304, 2432, 3072, 3200, 3328, 4096, 4224, 5120, 8192, 8320 | 2, 130, 258, 386, 514, 642, 770, 898, 1026, 1154, 1282, 1410, 2050, 2178, 2306, 2434, 3074, 3202, 3330, 4098, 4226, 5122, 8194, 8322 |

**Using Controllers:**

To get the SC-88 sound "Nylon+Steel," (PC 26, Variation 9), you used to do something that looked like this:

***Listing 10***

***Controller #0, 9***
***Controller #32, 0***
***Patch 25***

This calls variation 9, PC 26 which was OK for the SC-88 but to force map 2 on the SC-88 Pro and above we need to alter the controller #32 statement so that all higher Sound Canvas units will use the SC-88 map.

***Listing 11***

***Controller #0, 9***
***Controller #32, 2***
***Patch 25***

Simply adding 2 to controller #32 causes this listing to call the same SC-88 sound on every Sound Canvas 2nd generation or higher there will ever be. No SYSEX no methods, just a

changed controller. Simple. The controller events can be in either order so long as they precede the patch event. Test and save your file and you are done.

### Using Hybrid Technique:

If you were using the Controller #0 method in the past, it is possible to continue using the controller #0 method. All you need to do is change the controller #32 event before each patch call. However, remember that if your sequencer uses a set up page to initialize tracks, the hybrid technique will not work unless you repeat the patch call in your event listing with the controller #32 event preceding it.

Formerly you selected Nylon+Steel this way:

***Listing 12***

***Controller #32, 0***
***Patch, Controller 0, 9, 25***

Now a simple change will produce this listing:

***Listing 13***

***Controller #32, 2***
***Patch, Controller 0, 9, 25***

Listing 13 will call the correct SC-88 sound on every 2nd generation or higher Sound Canvas there is.

### *So how does this change my SC-88?*

This change has no effect on your SC-88. All you did was change bank selecting of the SC-88 map from indirect to direct addressing. Now on any SC-88 or higher Sound Canvas that track will always find its sound on map 2 which will always be the SC-88 map on every 2nd generation or higher Sound Canvas. No adjustments are required by the SC-88 Pro user.

## *SC-88 Pro Users*

The SC-88 Pro user may not yet be aware of incompatibility issues. After all, everything you create sounds right on all SC-88 Pro's. We will talk about accommodating earlier generations of the sound canvas first and then last we will deal with the need to be compatible with possible future generations of the Roland Sound Canvas.

### Accommodating SC-55 and SC-88 Users

There is no backward compatibility. If you use any unique SC-88 Pro sounds or employ the use of insertion effects, then former generations of the Sound Canvas can only get a gist of what your sequence was created to sound like.

Nonetheless, there are a few things you can do to make their listening experience of your sequences more workable.

There are several sounds in the SC-88 Pro map that are actually duplicated from the SC-88 map and even some from the SC-55 map. For example, the Synth Drum Capital Tone at PC 119 is the exact same sample on map 1, 2, or 3. If you use any sound that was native to an earlier generation you can select it on the lower map.

That way others using earlier models of the Sound Canvas can know for certain that the sound they hear on *that* track is the sound you intended. You lose nothing by doing this because there is no difference in quality between any sound found on the SC-88 Pro map that is a duplicate of a lower map sound.

Conveniently all duplicated sounds from other maps appear in the exact same bank and patch position in all maps. The only exception is PC 40 "X Wire Bass" that appears on the SC-88 Pro map in Variation 10, but is a duplicate of "X Wire Bass" Variation 09 on the SC-88 Map. The purpose of this one exception mystifies me a bit.

If you use any insertion effect, you can help SC-88 and SC-55 users by documenting somewhere in your sequence or in an accompanying text file how you used an insertion effect. Describe what tracks are involved and the effect you used in terms of its intensity.

That way some SC-88 or SC-55 users might be able to transfer to a multitrack the track(s) using insertion effects in sync with the MIDI file. Or perhaps they can isolate those tracks through a separate output and then process those recorded or isolated tracks through an external effects unit to duplicate your insertion technique.

**Accommodating future editions of the Sound Canvas with the SC-88 Pro**

Although no edition of the Sound Canvas has yet come out on the market to supersede the SC-88 Pro, very likely one eventually will. If it follows the architecture of the Sound Canvas it will use a new native map 4.

This means that the compatibility issue also requires correction on SC-88 Pro sequences or they too will become incompatible when those sequences are played on the yet to be developed 4th generation Sound Canvas. If the design remains consistent, the 4th generation Sound Canvas will redirect map 0 to its native map 4 by default.

In the following listings we will select the SC-88 Pro sound "House Bass" which is PC 40, Variation 22, on the SC-88 Pro map.

**Using Methods:**

Using the Normal method, you used to do something like this:

***Event Listing 14***

***Patch, Normal, 2816, 39***

In Listing 14, parameter 1 tells you this is a patch event. The fact that there are exactly three more parameters tells you it is using a bank switching protocol. Parameter 2 tells you it uses the Normal bank switching method. Parameter 3 tells you that your sequencer will extract from the bank value of 2816 new values to set controller #0 to a value of 22 and controller #32 to a value of 0. That means you are accessing SC-88 Pro sounds indirectly on unstable map 0. Parameter 4 tells you it then calls PC 40.

Now we want to up the value of controller #32 to use stable map 3, so we get a listing like this:

***Event Listing 15***

***Patch, Normal, 2819, 39***

In Listing 15, parameter 1 tells you this is a patch event. The fact that there are exactly three more parameters tells you it is using a bank switching protocol. Parameter 2 tells you it uses the Normal bank switching method. Parameter 3 tells you it will use the bank value to set controller #0 to a value of 22 and controller #32 to a value of 3. Now you are accessing SC-88 Pro sounds directly on map 3. Parameter 4 tells you it then calls PC 40.

The difference between listing 14 & 15 is that listing 14 uses map 0 (extracting CC32 from bank 2816), but listing 15 uses map 3 (extracting CC32 from bank 2819). Other than that, they both call the exact same patch on the SC-88 Pro. But the huge difference between listing 14 & 15 is that listing 14 will call a different sound patch on the SC-2000 Super Pro or whatever they name the 4th generation Sound Canvas. **But listing 15 will call the SC-88 Pro sound** on every single 3rd generation or higher Sound Canvas there ever was or ever will be. And again we did this without any SYSEX or Mode switching.

If you already use the Normal bank switching method, you are already accustomed to entering strange numbers like 2816 instead of 22 to get variation 22 sounds. All you need to do when you have completed your sequence is to add 3 to every SC-88 Pro native bank you used in map 0. You can isolate them because all map 0 Normal bank numbers are evenly divisible by 128.

Use the following table to double check the bank values you used. Test and save the file and you are done. Your file will sound correct on an SC-88 Pro and beyond.

| Variations on the SC-88 Pro Map | Do not use Map 0 Normal Banks | Instead use Map 3 Normal Banks |
|---|---|---|
| 0 (Capital Tones), 1, 2, 3, | 0, 128, 256, 384, | 3, 131, 259, 387, |
| 4, 5, 6, 7, | 512, 640, 768, 896, | 515, 643, 771, 899, |
| 8, 9, 10, 11, | 1024, 1152, 1280, 1408, | 1027, 1155, 1283, 1411, |
| 12, 13, 14, 15, | 1536, 1664, 1791, 1920, | 1539, 1667, 1794, 1923, |

| | | |
|---|---|---|
| 16, 17, 18, 19,<br>20, 21, 22, 23,<br>24, 25, 26, 27,<br>28, 29, 30, 31,<br>32, 33, 34, 35,<br>40, 41, 42, 43,<br>44, 45, 48 | 2048, 2176, 2304, 2432,<br>2560, 2688, 2816, 2944,<br>3072, 3200, 3328, 3456,<br>3584, 3712, 3840, 3968,<br>4096, 4224, 4352, 4480,<br>5120, 5248, 5376, 5504,<br>5632, 5760, 6144 | 2051, 2179, 2307, 2435,<br>2563, 2691, 2819, 2947,<br>3075, 3203, 3331, 3459,<br>3587, 3715, 3843, 3971,<br>4099, 4227, 4355, 4483,<br>5123, 5251, 5379, 5507,<br>5635, 5763, 6147 |

**Using Controllers:**

To get the SC-88 Pro sound "House Bass," (PC 40, Variation 22), you used to do something that looked like this:

***Listing 16***

***Controller #0, 22***
***Controller #32, 0***
***Patch 39***

This calls variation 22, PC 40 which was OK for the SC-88 Pro but to force map 3 on all SC-88 Pro and above we need to alter the controller #32 statement so that all higher Sound Canvas units will use the SC-88 Pro map.

***Listing 17***

***Controller #0, 22***
***Controller #32, 3***
***Patch 39***

Simply adding 3 to controller #32 causes this listing to call the same SC-88 Pro sound on every Sound Canvas 3rd generation or higher there will ever be. No SYSEX, no modes, just a changed controller. Simple. The controller events can be in either order so long as they precede the patch event.

**Using Hybrid Technique:**

If you were using the Controller #0 method in the past, it is possible to continue using the controller #0 method. All you need to do is change the controller #32 event before each patch call. However, remember that if your sequencer uses a set up page to initialize tracks, the hybrid technique will not work unless you repeat the patch call in your event listing with the controller #32 event preceding it.

Formerly you selected House Bass this way:

***Listing 18***

***Controller #32, 0***
***Patch, Controller 0, 22, 39***

Now a simple change will produce this listing:

***Listing 19***

***Controller #32, 3***
***Patch, Controller 0, 22, 39***

Listing 19 will call the correct SC-88 Pro sound on every 3rd generation or higher Sound Canvas there is.

### *So how does this change my SC-88 Pro?*

This change has no effect on the sound of your SC-88 Pro. All you did was change bank selecting of the SC-88 Pro map from indirect to direct addressing. Now on any SC-88 Pro or higher Sound Canvas that track will always find its sound on map 3 which will always be the SC-88 Pro map on every 3rd generation or higher Sound Canvas.

If you follow these guidelines, every sequence you create for the SC-88 Pro can sound exactly the same when the sequence is played on any Sound Canvas yet to be developed. As with all Sound Canvas models, the idea is to avoid the use of map 0.

## *In conclusion:*

If you can understand how to use either Methods, Controllers, or the Hybrid technique to directly address the map you intend to use then you will never have an upward compatibility problem again with any sequence you share with other Sound Canvas users.

## Chapter Four, Sequencing Etiquette

# Creating Helpful Documentation:

Things can go wrong and often will. If you send your MIDI file by email or upload it to a web site, the process can glitch a byte or two that can either make your file unplayable or it can make alterations in your file that the recipient might be able to correct. I have downloaded plenty of files with glitched notes lasting up to 512 measures.

It is also possible that your MIDI file might do certain things to someone else's sound canvas that might not be as easy for them to undo as it was for you. Your file should contain some form of documentation that explains what you did to alter any operating parameters of the Sound Canvas with SYSEX. At least tell them what they need to do to return to a normal condition.

Some Sound Canvases were manufactured for the road and as a result they retain all parameter settings at power down. Other desktop models always power up in a factory default mode. What this means is that if you do something to your Sound Canvas that requires you to shut it off before you move on to something different then you will make owners of portable Sound Canvas equipment a little irritated.

If they do not know what you did, the only way they can undo it is by performing a factory reset which might also mean having to reload all the special parameters or user altered sounds they wanted to retain at power down as they travel from gig to gig. There are many more reasons why documentation can be helpful and so the following documentation is helpful.

## *Name Your Song*

If you have a name for your song, use it as the file name if possible or enter it into the information or comment area of the MIDI file. This can be a text event, or a comment in the header. Most sequencers offer you a place to enter basic information such as title, author, and copyright. All, if not most, of that information will get imbedded in the MIDI file you create.

Some titles are better left as mysteries. But if you want to share how you came up with the name then we might enjoy knowing. You also might want to include the names of other sequences if this sequence is merely one of many parts.

## *Name Your Sounds*

It is helpful to label the name of the sound you are using in each track It is even more helpful if you mention what map you intended to use. If you have patch changes within a track, then follow it with a text event to tell us a little about the new patch.

You might think that the instrument definition provides everyone with a name, but you can't rely on that. If you used your native map 0 then those with a different native map will not be aware of the error. Also, if they are using an instrument definition that is different from yours or does not include higher maps then they might not get a clue from their instrument definition. Some sequencers have no instrument definitions.

## *Practice Safe SYSEX*

If you use standard SYSEX messages such as a GS reset, that is rather expected in a GS sequence. However, when you are altering envelopes, filters, mixing parts, or doing anything clever, find a way to document what the SYSEX routines accomplish. With this kind of documentation anything you do can be undone by others if necessary.

Two polite techniques when using SYSEX. (1) If you accomplish something unusual that will not respond to a GS reset, then write another SYSEX event for the end of the song that will return parameters to normal.

And (2), if you borrow a neat SYSEX trick from someone else, then give credit for where you got the neat little trick. Since the Roland Sound Canvas has a predetermined architecture, SYSEX routines are not protected by copyright. The parameters and their variability is public domain. Nonetheless, give credit where credit is due.

## *Name Your Synth*

Tell us what Sound Canvas **family** and **model** you used when creating your sequence. We are not all experts at what models belong to what family. You know your M-GS64 is essentially an SC-88, so mention both. If your model has certain peculiarities then those knowledgeable might understand more of what you intended if they do not hear it the same way you wanted them to.

In addition, those knowledgeable about the differences between synths will be able to "correct" settings if you did not follow these guidelines completely. Then they can still hear your sequence exactly the way you wrote it.

## *Use MIDI Format*

As amazing as it may seem, not all Sound Canvas owners use the same sequencer you use. Specialized file formats only serve to exclude listeners to your creation. All sequencers worth using with a Sound Canvas will play MIDI files in format 1.

SC-88 and SC-88 Pro users can not use MIDI format 0 if they used two output ports even if they used 16 voices or less. SC-55 users are the only ones who lose nothing by saving their sequences using MIDI format 0. All software that can read format 1 can also read format 0.

# Chapter Five, SCUG Resources,

## *The following web sites might prove useful to you as a Sound Canvas user.*[1]

SCUG, the Sound Canvas Users Group
http://www3.sk.sympatico.ca/gbraun/scug/

Sound Canvas Carry All (You could spend an entire month surfing here. My Cakewalk instrument definition is here as well.)
http://www3.sk.sympatico.ca/gbraun/carryall/carry.htm

SCPOP, Sound Canvas Pipe Organ Project
http://www.scpop.de/

List of all GS synths currently available maintained by Gary Agnew
http://www.in-motion.net/~agnew/sctypes.html.

Edirol Corp.
http://www.edirol.com/

Roland Corporation
http://www.rolandcorp.com/

Sound Canvas Patch Map by Bob Ihrman
http://www3.pgh.net/~rihrman/newpage11.htm

Sound Canvas Tech sheets
http://www-personal.umich.edu/~polot/techsheet/canvas.html
http://www-personal.umich.edu/~polot/techsheet/bulk.html
http://www-personal.umich.edu/~polot/techsheet/nrpn.html
http://www-personal.umich.edu/~polot/techsheet/sysex.html

ThinkMIDI site. This is my web site. Not intended to be spectacular, but it holds my Cakewalk instrument definitions, the latest copy of these guidelines and a few other helps that I offer.
http://members.aol.com/thinkmidi/

The latest version of this book should be available here.
http://members.aol.com/thinkmidi/scguide.htm

[1] If you have a site or know of a site useful to SCUG members let me know about it at RWGreaves@juno.com. Thanks.

## *You can find software tools for the Sound Canvas at these web sites.*

88 Edit

http://members.home.com/greatwhite/88edit.htm

The URL below is a press release (with links) to SYSEX files allowing the Sound Canvas series to respond to Yamaha Continuous Controller #2 (Breath Control), output by the Yamaha WX series wind controllers.

http://windsynth.org/cgi-bin/shownews?path=news&fn=1999_04_21&return_to=lobby

The latest version of MIDI-OX is on Jamie O'Connell's web site. It is a multiclient NT driver.

http://www.channel1.com/users/jamieo/midiox.html

Mike Le Voi (mlevoi@modemss.brisnet.org.au) or (mikel@hds.com.au) has a home page where you can find his tools **VBSYX** - The XG/GS SYSEX Decoder and **WINJUK95** - The XG/GS MIDI Jukebox.

http://modemss.brisnet.org.au/~mlevoi

# Acknowledgments

The following SCUG members helped me by reviewing the preliminary and secondary text. They pointed out areas where I was vague, verbose, and where I made no sense. They even asked excellent "wrong" questions which helped me get a better grasp of what I can not assume every Sound Canvas user understands. And since I have never owned an SC-55 personally, some comments were absolutely indispensable to helping me achieve maximum clarity.

## *Special thanks to:*

### Gary Agnew

Gary works for Delphi Automotive Systems as a electronic and refrigeration troubleshooter for production machinery. He has been married to Patricia for 25 years. They have three kids - Lindsey, in college; Michael, in high school; and Kelly in elementary school. Gary plays the bass and an acoustic guitar. He started using a Roland SCC-1 Sound Canvas in 1991 and joined the Sound Canvas Users Group mail list in March of 1995. Somehow we tricked him into organizing the groups archives for the last few years. He has found SCUG members to be a great help.

### Simon Franklin

Simon has played the piano since childhood but that became difficult after becoming ill five years ago. So he has been sequencing on and off for about 4 years. He uses an SC-88 and sequences on a Power Mac 7100/80 with Metro, a sequencer now distributed by Cakewalk.

He wrote to me saying, "I am still learning the nuances of sequence construction for the Sound Canvas. I hope to increase my usage of it this year. It's a great escape! I love downloading the SCUG archives and hearing other people's works." And if that's what Simon says, perhaps you all better do it.

Simon lives in Pittsburgh, PA. He formerly worked as a molecular biologist but developed Chronic Fatigue Syndrome in 1994. You can visit his home page at:

http://users.aol.com/slyfrank/index.html

### Mike Le Voi

Mike Le Voi is an Advisory Systems Engineer for Hitachi Data Systems. In his spare time, he is a recording engineer for 4MBS-FM, a classical music radio station in Brisbane, Australia, and he also is an expert on Roland's GS and Yamaha's XG MIDI implementation. He has written some very useful MIDI programs that play MIDI files and decode Roland and Yamaha system exclusive messages (SYSEX) in such a way that the hexadecimal strings become meaningful to musicians and composers alike. These programs can be downloaded from his home page at:

http://modemss.brisnet.org.au/~mlevoi

### Edward Lotter

Eddie is from Hollywood California and uses an SCC1, as well as the SC-88VL. He has been using a Sound Canvas for 6 years as a hobby.

Look for Eddie's MIDI tutorials at http://members.delosnet.com/tlc/MidiTuts.htm

### Kevin Wright

Kevin, born in 1963, started playing guitar at age 10. About five years ago (1993) he purchased an SC-88, a sequencer, MIDI i/o board and a PC200mkii. After a couple of years of head scratching & frustration, he now helps others in his locality.

As part of his self-employment, he helps others set up their MIDI rigs, hard disk recording systems, and related hardware. He has experience with CD duplicators and several music related units such as: SC-55mkii, MT200, PMa5, VS-880, MV-30, VG8-EX and MOTU Micro Express MIDI i/o.

Married 12 years, with 2 kids. He writes, "I love my kids!!" Kevin lives in Port Stephens, New South Wales. Which is on the Australian east coast, about 200km north of Sydney).

He uses his SC-88 predominately for doing backing tracks to be used for recording, and/or live performance in solo/duo/trio acts ... and as he says, "to keep me off the streets and out of the pub at nights!"

### About the author

I am from the Binghamton, NY area. There I combine MIDI with my electric guitar as a worship leader at First Christian Church of Binghamton. I also use my SC-88ST Pro for arranging and scoring music for other song writers and performers. I cut my teeth learning MIDI sequencing with the very first release of Cakewalk.

Although I have a degree in computer programming, I prefer computers as a hobby rather than as a career. The closest I get to computer programming anymore is sequencing MIDI and maintaining three web sites. I am the director of Agape Renewal, a ministry based on a philosophy of God's love, reaching out to those who are recovering from sexual addiction.

I receive personal email using RWGreaves@juno.com and ministry email using FreeUcanB@aol.com.

# Tables

Convert SC-55 Normal Bank Numbers

| To Get SC-55 | Controller #0 Bank Number | Formula to Convert | Normal Bank Number |
|---|---|---|---|
| Capital Tones | Use Bank 0 | 0 * 128 + 1 | Use Bank 1 |
| Variation 1 | Use Bank 1 | 1 * 128 + 1 | Use Bank 129 |
| Variation 2 | Use Bank 2 | 2 * 128 + 1 | Use Bank 257 |
| Variation 3 | Use Bank 3 | 3 * 128 + 1 | Use Bank 385 |
| Variation 4 | Use Bank 4 | 4 * 128 + 1 | Use Bank 513 |
| Variation 5 | Use Bank 5 | 5 * 128 + 1 | Use Bank 641 |
| Variation 6 | Use Bank 6 | 6 * 128 + 1 | Use Bank 769 |
| Variation 7 | Use Bank 7 | 7 * 128 + 1 | Use Bank 897 |
| Variation 8 | Use Bank 8 | 8 * 128 + 1 | Use Bank 1025 |
| Variation 9 | Use Bank 9 | 9 * 128 + 1 | Use Bank 1153 |
| Variation 16 | Use Bank 16 | 16 * 128 + 1 | Use Bank 2049 |
| Variation 24 | Use Bank 24 | 24 * 128 + 1 | Use Bank 3073 |
| Variation 32 | Use Bank 32 | 32 * 128 + 1 | Use Bank 4097 |
| MT-32 sounds | Use bank 127 | 127 * 128 + 1 | Use Bank 16257 |

Convert SC-88 Normal Bank Numbers

| Variations on the SC-88 Map | Do not use Map 0 Normal Banks | Instead use Map 2 Normal Banks |
|---|---|---|
| 0 (Capital Tones), 1, 2, 3,<br>4, 5, 6, 7,<br>8, 9, 10, 11,<br>16, 17, 18, 19,<br>24, 25, 26, 32,<br>3, 40, 64, 65 | 0, 128, 256, 384,<br>512, 640, 768, 896,<br>1024, 1152, 1280, 1408,<br>2048, 2176, 2304, 2432,<br>3072, 3200, 3328, 4096,<br>4224, 5120, 8192, 8320 | 2, 130, 258, 386,<br>514, 642, 770, 898,<br>1026, 1154, 1282, 1410,<br>2050, 2178, 2306, 2434,<br>3074, 3202, 3330, 4098,<br>4226, 5122, 8194, 8322 |

Convert SC-88 Pro Normal Bank Numbers

| Variations on the SC-88 Pro Map | Do not use Map 0 Normal Banks | Instead use Map 3 Normal Banks |
|---|---|---|
| 0 (Capital Tones), 1, 2, 3, | 0, 128, 256, 384, | 3, 131, 259, 387, |
| 4, 5, 6, 7, | 512, 640, 768, 896, | 515, 643, 771, 899, |
| 8, 9, 10, 11, | 1024, 1152, 1280, 1408, | 1027, 1155, 1283, 1411, |
| 12, 13, 14, 15, | 1536, 1664, 1791, 1920, | 1539, 1667, 1794, 1923, |
| 16, 17, 18, 19, | 2048, 2176, 2304, 2432, | 2051, 2179, 2307, 2435, |
| 20, 21, 22, 23, | 2560, 2688, 2816, 2944, | 2563, 2691, 2819, 2947, |
| 24, 25, 26, 27, | 3072, 3200, 3328, 3456, | 3075, 3203, 3331, 3459, |
| 28, 29, 30, 31, | 3584, 3712, 3840, 3968, | 3587, 3715, 3843, 3971, |
| 32, 33, 34, 35, | 4096, 4224, 4352, 4480, | 4099, 4227, 4355, 4483, |
| 40, 41, 42, 43, | 5120, 5248, 5376, 5504, | 5123, 5251, 5379, 5507, |
| 44, 45, 48 | 5632, 5760, 6144 | 5635, 5763, 6147 |